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19th Annual Canine Symposium: Your Veterinarian and Your Dog

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The 19th Annual Symposium *Your Veterinarian and Your Dog* was held on January 28, 1989 at the Veterinary Hospital of the University of Pennsylvania. The event was supported by a contribution from The IAMS Company.

Dr. Darryl N. Biery, professor of radiology and chairman, Department of Clinical Studies, Philadelphia, welcomed a capacity crowd. Following are the summaries of the presentations.

Hip Dysplasia

Ever since canine hip dysplasia was first diagnosed 50 years ago dog breeders have worked to eliminate this disorder from their bloodlines. Radiographic screening of breeding stock through the Orthopedic Foundation for Animals has been in place for many years. Yet the number of afflicted animals has not significantly decreased and hip dysplasia remains the most common orthopedic problem in canines. Dr. Gail K. Smith, associate professor of orthopedic surgery, discussed the disease and a more precise method of radiographically screening dogs.

Canine hip dysplasia can be defined as "hip joint laxity resulting in degenerative joint disease." Its cause is not clear, but it is known to be due in part to hereditary factors. Environmental factors, such as excessive exercise at an early age or unlimited access to food, also play a role in the expression of the disease, as does the growth rate. Rapidly growing dogs are more prone to manifest the disease than those which mature more slowly. Almost all breeds of dogs are affected, though it is seen more commonly in large and giant breeds where more than 50% of the population may be affected.

In an afflicted animal the hip joints are lax, setting the stage for tissue inflammation and degenerative joint disease. The manifestation of the disease varies. In some cases it may be evident only radiographically with the animal exhibiting no signs of discomfort while in other cases dogs may show exercise imolerance or signs of pain. Dogs severely afflicted with the disease may have difficulty in rising and may be reluctant to engage in the normal activities of puppyhood. Treatment can range from daily administration of analgesics to surgical removal of the hip joint. Such treatment does not cure the disease, but it will significantly reduce the animal's discomfort.

"The hip joint is the least constrained of all the joints in the body, having the largest range of motion," Dr. Smith explained. "A ball and socket joint, it is held in place by the round ligament, the joint capsule, muscle forces and a newly discovered 'hydrostatic constraint.' The hydrostatic constraint consists of the synovial fluid acting together with the joint capsule to create a vacuum-like effect preventing coxofemoral subluxation. From an awareness of this new stability factor we designed a clinical stress-radiographic method to measure (quantitate) hip joint laxity. This method differs significantly from the standard hip-extended method in which radiographs are used to detect subluxation and signs of degenerative joint disease."

By the standard method severe cases may become evident radiographically at an early age (6 mos.), but more than 70% of dogs with hip dysplasia at this age will be diagnostically missed. It is thought if signs of the disease are not evident by age two the dog is free of hip dysplasia. Selective breeding based on this radiographic screening program has not greatly reduced the number of dysplastic animals.

For the standard radiographic screening method the dog is positioned on its back, the legs are in parallel position and extended horizontally. This causes a rotation, in effect tightening the joint somewhat. The standard technique, Dr. Smith believes, can lead to false readings as a joint may appear tighter than it is.

The method developed by Drs. Gail Smith and Darryl Biery here at Penn requires two views. For both views the dog is positioned on its back. For the first film the legs are kept at a neutral flexion-extension angle, simulating the natural standing position. No tightening of the joint occurs. This view shows the natural fit of the hips. For the second view the legs are in the same position and stress is applied to the joint, to determine the maximum lateral displacement of the femoral head from the acetabulum. The technician measures distance between ball and socket in the two views and calculates the laxity. The researchers have developed a laxity index scale which ranges from 0 to 1. Hips approaching 0 are very tight and hips approaching 1 are very loose. Dr. Smith stated that all dogs have finite hip joint laxity. Performance breeds, such as racing greybounds, have mean hip joint laxities significantly tighter than breeds known to suffer from hip dysplasia.

During the study, litters of large breed dogs were followed longitudinally from the age of four months. It was found that those developing degenerative joint disease earliest were the animals which showed greatest laxity at an early age and that those dogs having loose hips are subject to greater variation in laxity with age. The trend is for the hip joint, like other joints in the body, to tighten somewhat with maturation. This tightening, however, is of small magnitude and rarely shifts the designation of a hip joint from abnormal laxity to normal laxity. It was also found that those dogs with tight hips at four months retained tight hips with growth unless trauma intervened. Dogs with loose hips as determined by the new method have a significantly higher incidence of degenerative joint disease than those with tight hips. In fact, a major discovery was the existence of a distinct laxity index threshold, below which the probability that a dog will develop hip dysplasia is 0. In support of this finding is the observation that the hips of all borzois and racing greyhounds, breeds known to be free of CHD, fall below this threshold.

A breeding pair of German shepherds with low laxity indexes was mated. The resulting litter showed a marked decrease in hip joint laxity. Six of the pups fell below the threshold and the other three had a lower laxity index than the overall German shepherd population evaluated so far here at the School.

Dr. Smith feels the incidence of canine hip dysplasia can be significantly reduced if only those dogs are used for breeding which exhibit a tight hip fit at an early age. The breedings of German shepherds done as part of the study suggest that "like begets like" and that one can shift the laxity index toward the lower end of the scale. It will take more than one generation of dogs, but preliminary findings indicate that the method to diagnose susceptibility to CHD developed at Penn, if utilized as a criterion in selective breeding, holds the promise of dramatically reducing the incidence of canine hip dysplasia. Dr. Smith and his colleagues are now studying litters as young as eight weeks to determine whether a laxity index at this age can be reliably measured and whether this index can predict the puppies' susceptibility to hip dysplasia.

While the exact cause of hip dysplasia is not known, it has been shown that hereditability plays a role. Further studies are needed to determine which components of the joint play a major role in the development of the disease. For example, the animals with abnormal laxity have a greater volume of synovial fluid. Studies are needed to determine the causes of this.

Dr. Smith acknowledged the cooperation of a number of breeders of German shepherd dogs and a borzoi breeder who have cooperated throughout this study and have brought their young litters in for radiographs. These breeders (and the owners of the dogs) then took further time to bring back the dogs for radiographs so they could be evaluated longitudinally. Dr. Smith and his colleagues are now gathering the same data for other breeds. The project has been supported by the Biomedical Research Support Gram Program, Division of Research Resources, National Institutes of Health; the University of Pennsylvania Research Fund; the Morris Animal Foundation; and the Seeing Eye, Inc.

Photo C: Standard extended view of the hips of a six-months old German shepherd, showing hardly any laxity.

Photo D: Distracted view of the hips of the same dog, showing about 30 percent more laxity than evident in the standard extended view.

Understanding What Happens When Your Dogs are Anesthetized

Anesthesia, a very necessary process in veterinary medicine, often worries owners. Dr. Alan Klide, associate professor of veterinary anesthesia, discussed anesthesia to help owners understand it.

Many different drugs are utilized such as narcotics, tranquillizers, barbiturates and inhalants. In each case the drugs and dose chosen are tailored to the particular patient and the procedure performed.

During anesthesia a patient is unaware, does not feel pain, and has minimal responses to a pain producing event. This is accomplished by giving certain drugs, either by injection or inhalation. The drugs which produce this necessary and important state, also have effects not only on the brain but also on many different parts of the body. In general these effects interfere with normal function but the degree of this interference is usually small, and the duration usually relatively short, so that the patient can tolerate these effects. The drugs can affect many systems but the ones that are most critical are the respiratory system (breathing) and the cardiovascular system (heart and blood vessels-circulation). If breathing is depressed the patient can be ventilated mechanically until the effect of the drug wears off. If the heart is depressed it can be stimulated, up to a certain point. If the depression cannot be overcome, the patient dies. This is not meant to scare but to illustrate what happens under anesthesia and what the risks are.

It is continually believed by many dog breeders that their breed is particularly sensitive to 'anesthesia' or the effects of certain drugs. There is very little scientific information to show that there is a difference between breeds in response to drugs, however there is some. Sighthounds and greyhounds in particular have been studied, and they do respond to a different degree to a certain type of anesthetic, called ultra short lasting barbiturates. They react differently for at least two reasons. The first is that in general they are very lean, i.e. have very low body fat. One of the ways that the amount of these barbiturates in the blood goes down is because the drug goes into the fat. If there isn't much fat the blood level falls more slowly. The second is that the liver removes many drugs including barbiturates and greyhounds' livers do this more slowly than most other breeds.

There is no other information to show that anesthesia is any more or less dangerous in any other breeds. Part of the reason for the breeders' concern about anesthesia may be that they, or others, remember problems and deaths that occurred many years ago, and they keep thinking about that. The anesthetics in use today are much safer and there is a greater variety to choose from. However, it must be kept in mind that critically ill patients do present a risk.

There is no question that individuals respond differently to drugs. This range of responses is most obvious with anesthetic drugs. What are we likely to see if we give a certain dose of an anesthetic, based on the weight of the dog, to 10 dogs and observe the depth of anesthesia which results? If we have chosen what normally is an appropriate dose to produce a moderate depth of anesthesia, we will see that perhaps six of these 10 dogs will be at a moderate depth of anesthesia. Of the remaining dogs, two will be at a deeper depth of anesthesia and two will be at a lighter depth of anesthesia. Of the two that are at a deeper depth of anesthesia one might die if it is not supported by mechanical ventilation or drugs for its cardiovascular system. Of the two that are at lighter depth of anesthesia one might not even be anesthetized or lie down.

There are differences in breeds in relation to their attitudes on life, pain, and adversity. Some breeds will wake up from anesthesia very differently than others. For example, Siberian huskies and Irish setters are likely to wake up with much more excitement than other breeds. The likelihood of excitement during recovery also depends a great deal on the site of surgery — a dog that had surgery around its head and neck is much more likely to wake up more excited than a dog that had surgery in its abdomen.

Many drugs are given when a dog is anesthetized. They are used for different effects. The first drugs the dog is likely to receive before it is anesthetized are the pre-anesthetic drugs. One type of drug is used to decrease secretions and to keep the heart from going too slowly during the beginning of anesthesia. Another type of drug will be given to sedate the dog. This drug may be a narcotic, a tranquillizer, or a sedative. Then anesthesia is most commonly induced with an ultra short lasting barbiturate given intravenously. There are other injected drugs which are sometimes used to induce anesthesia. Anesthesia may also be induced by having the dogs breath an inhalation anesthetic. After anesthesia is induced, a tube is usually placed through the mouth into the trachea so that the dog can breath without any obstruction to the flow of air into and out of the lungs, and to prevent aspiration into the lungs of material regurgitated up from the esophagus or stomach. The endotracheal tube is then connected to an anesthesia machine from which the dog breathes an inhalation anesthetic. The most common ones are halothane, isoflurane and methoxyflurane. They each have different properties that make them useful or dangerous under different circumstances. After anesthesia the endotracheal tube is removed as the dog wakes up. The dog may receive medication to prevent pain at this time.

There are many drugs in each category. They each have different properties that make them useful or dangerous under different circumstances. There is, almost never, only one way to do anything, and this is true for anesthesia too. In any particular circumstance different drugs in each category may be appropriate. The other side is also true, i.e. there are circumstances where certain drugs or techniques should definitely not be used.

Veterinarians are taught various aspects of anesthesia throughout their time in veterinary school by faculty and technicians who are specialists in anesthesia. The subject requires a thorough understanding of how the body functions and the effects of drugs and disease on the body. Anesthesia then builds on this base of information to be able to determine the best drugs and techniques to use in different circumstances. This is taught in the classroom and also in the operating room where students administer anesthesia under the supervision of faculty anesthesiologists and veterinary anesthesia technicians.

Computers are beginning to be used in teaching and clinical veterinary medicine. We are using them to help teach anesthesia. There are computer programs which are simulations of the administration of anesthesia to patients, and the students can interact with the computer to choose drugs and concentrations and then see what effect their choice makes on the patient. This allows gaining experience without actually having to use an animal. The computers can also be used for calculations in the operating room and as a data bank instantly available on many subjects of critical importance.

In veterinary practice, anesthesia may be administered by different people. The veterinarian may administer the anesthesia, i.e. the same person will be doing the surgery and monitoring the animal under anesthesia. There are now trained animal health technicians that are employed by veterinarians and they may be the person administering the anesthetic. Rarely in a veterinary practice does one veterinarian do the procedure, surgical or otherwise, and another veterinarian administer the anesthetic, as in human anesthesia, except in veterinary schools and in a few practices.

Anesthesia is a very important, common, but dangerous, part of veterinary medicine. It can be done in a manner which makes it as safe as possible or it can be done in a manner which is less safe.

Emergency Care and Treatment for the Canine

Emergency medical situations for the pet can occur at home, while traveling, or while engaged in a recreational pursuit. Often the initial assistance given to the animal can make a difference between life and death. Dr. Rebecca Kirby, assistant professor of medicine and director of the Emergency Service at the Veterinary Hospital of the University of Pennsylvania, provided an overview of how owners can recognize a potentially life-threatening problem in a pet, how they can detect abnormal physical parameters and how an animal can be stabilized prior to transporting it to an emergency veterinary facility. Owners should also be familiar with their dog's normal vital signs and how to detect signals of trouble. In an emergency, information about body temperature, pulse rate, and color of the mucous membrane provide vital information to the veterinarian.

The normal rectal temperature for the dog is within the range of 101-103 degrees Fahrenheit. Body temperature less than 100.5 F is suggestive of either cold exposure or poor circulation and shock. An elevation in rectal temperature above 103 F in a calm animal is suggestive of either heat exposure, prolonged muscle activity or inflammation within the body. Extremes in body temperature, in either direction, warrant immediate evaluation by a veterinarian. One should not apply surface heat if the temperature is low or submerge the animal in ice water if the temperature is high. The veterinarian should be consulted first.

It is important to evaluate the pulse rate and strength. In the dog, the easiest pulse to locate is the femoral pulse. The femoral artery lies on the inside of the rear leg, just below the hip joint. There is a poorly muscled triangular area within which the artery lies. In the dog, the normal rate is between 60 and 150 beats per minute. The heart rate will vary with the breed, size and/or activity of the dog. Heart rates consistently below 60 or above 180 beats per minute in any breed warrant evaluation by a veterinarian.

The strength and intensity of the pulse is also noted. Pulses that are rapid and "bounding" are compatible with early stages of shock, dehydration, excitement, or exercise. Pulses that are weak and "thready" can be suggestive of a more advanced stage of shock or severe anemia. These findings should be reported to the veterinarian.

The color of the mucous membranes (gums) can provide a reflection of how well the body is being given oxygen. The gums should be pink in color in a non-pigmented area. Bluish coloration reflects cyanosis and is suggestive of poor oxygenation of the blood. Brown coloration is suggestive of an abnor-

mality of the oxygen carrying system within the red blood cells, often due to drug toxicities such as acetaminophen or nitiates. Grayish gum color is compatible with poor circulation and shock. White gum color is seen with shock or severe anemia. When the gums are "brick red," toxins, fever and the very early stages of shock are possible causes.

Evaluating the body's ability to circulate blood to the tissues can be done by testing the capillary refill time (CRT). The gum is exposed and a non-pigmented area found. The gum is compressed with the finger and the finger immediately withdrawn. Where the compression took place, the gum will be white, due to the physical movement of the red blood cells away from the area by compression with the finger. In the normal animal, the length of time it takes for the gum to return to its previous color should be less than 2 seconds (called the CRT). CRT greater than 3 seconds is suggestive of poor circulation and shock. Veterinary assistance should be sought immediately.

Normal animals should be bright, alert and responsive to familiar commands. Changes in the level of consciousness can manifest as seizure activity, hyperexcitability, mental dullness, loss of consciousness but arousable with pinching of the toes (stupor), or loss of consciousness and not arousable (coma). Any of these changes should be reported to a veterinarian immediately.

The owner should observe the size and light response of the animal's pupils if the level of consciousness is abnormal. Report if the pupils are normal, small or greatly enlarged. A light is directed into the eye and it is noted whether or not the pupil constricts in response to the light. Any abnormal eye positions or movement should be noted and reported to the doctor. These changes can help localize where the problem might be occurring.

Dehydration can lead to poor circulation and poor organ function. Early detection is important. The owner can check the animal's gums and see if they are dry when they should be moist. The skin located over the shoulder region can be elevated from the body and allowed to fall back into place. This should occur easily and quickly. The eyes should be moist and shiny. When found to be dull and sunken into the skull, dehydration is likely. Veterinary help should be sought as soon as possible.

An animal's breathing pattern should be smooth and easy. Expiration is generally passive and the normal rate of respiration is between 12-20 breaths per minute. Exercise, excitement, or heat exposure may alter the rate in a normal animal.

When no breathing is observed and no passage of air is felt coming from the nostrils, immediate mouth to nose breathing support by the owner is required and veterinary assistance sought immediately. Less severe abnormalities which require medical evaluation include labored breathing efforts; rapid, shallow breathing; abdominal breathing; or loud, noisy breathing.

Several life-threatening problems can first be manifested by abdominal enlargement. Normally, the animal's abdomen should be considerably smaller than the diameter of the posterior portion of the rib cage. Should the diameter enlarge acutely, veterinary assistance should be sought immediately.

When an animal is observed to have difficulties urinating or has not been observed to urinate for a significant period of time, it is useful to feel the size of the urinary bladder. The bladder is located just anterior to the front part of the pelvis, deep within the abdomen. One hand is sufficient in small animals (under 15 pounds), or both hands are used in larger animals. A small amount of compression of the abdomen is required. The urinary bladder will feel like a water-filled small balloon when it is full. Care must be taken not to put pressure on the bladder. Should the bladder be very large and painful, or the animal be observed unable to pass urine, immediate veterinary assistance is required.

Following are emergency procedures which the owner can perform to stabilize the animal. By far the most common emergency is an animal hit by a car. The first consideration has to be a safe spot for the person attempting to help. Once the attention is turned to the animal, three areas have to be addressed: airway, breathing, circulation.

Mouth, nose and throat should be examined for obstructions and any debris such as dirt, mucous, or foreign bodies should be removed. If an object is totally obstructing the airway and is lodged in the throat and cannot be removed by hand, then a modified Heimlich maneuver can be used to dislodge the object. This is done by applying four or five firm compressions to the thorax (where abdomen joins the chest) just as one would do in a human. The maneuver should not be tried for more than thirty seconds. If it fails to clear the airway, then a small hole must be made into the trachea (windpipe) and the hole held open (a straw or an empty barrel of an ink pen can be used when available) to allow passage of air to the lungs.

Once the airway has been cleared and if it is determined that the animal is not breathing, then mouth to nose resuscitation can be initiated. The mouth of the dog has to be tightly shut, and the owner places his mouth tightly over the dog's nose. If a hole had to be made into the trachea, air has to be blown into it through whatever was used keep the hole open.

After four full breaths one should evaluate the animal for heart beat and pulse. If these are not present, then chest compression has to begin. If the animal weighs 15 pounds or less, the chest is encompassed by the owner's hands, with the palm of one hand over the spine, and the palm of the other hand over the sternum, with fingers extending over the rib cage. Chest compressions are done directly over the heart. Larger animals are placed on their side with the spine toward the person. The palms of the hands are used to compress the rib cage at the widest level of the chest. Using either method, the rib cage is compressed only 1/4 to 1/3 of the normal diameter. The rhythm of the mouth to nose breathing and chest compressions should be: initially four full breaths and check for heart beat...If none, compress chest five times and then breath for the animal, compress chest five times, breath...

Pulses and heart beat should be evaluated every two minutes. If no heart beat is detectable within 20 minutes, the animal should be presumed dead. Every effort should be made to transport the animal to an emergency facility during the resuscitation procedure.

Animals that have been traumatized or are acutely ill may be in pain. Otherwise lovable dogs may snap or bite. Caution must be observed, and when indicated, a muzzle may be needed. If roll gauze is not available a necktie or panty hose can serve to fashion a muzzle. If the animal has vomiting as a major problem, a muzzle which forces the mouth tightly shut should not be used.

When trauma is the cause of the injury, animals are frightened. They can be calmed by placing a light cloth over their head to cover their eyes, removing sight stimulus.

Bleeding can become a life-threatening problem and should be controlled as soon as possible. Internal hemorrhage may not be evident. When blood is seen around the animal, the owner must make a rapid search for the origin. Once found, bleeding is controlled by: applying gentle pressure over the site of the hemorrhage. If bleeding occurs from a limb, this should be elevated. Bleeding may stop.

A compression bandage can be placed over the bleeding site, with mild pressure applied not only directed over the site, but also for a short distance above and below the site. When the blood soaks through the bandage, do not remove the bandage. Instead, place additional bandage material over the bandage in place.

Only very rarely are tourniquets needed. If the bleeding can not be controlled by any other means, a tourniquet can be placed above the bleeding site. It must be loosened at least every 10 minutes to allow blood flow to the distal portion of the limb. Obviously, tourniquets should not be placed on the neck, chest or abdomen of the animal.

Any open wounds or exposed tissues should be covered with a warm, wet cloth. Drying of tissues delays healing and predisposes the tissues to infection.

If any of the limbs appear to have a severe fracture and are "dangling" (in danger of having bone fragments penetrate the skin), they should be immobilized. When the fracture is below the elbow or the knee, a rolled up newspaper or magazine can be used as the splint board and roll gauze, a neck tie or panty hose used to attached the limb to the make-shift splint. Attempts should not be made to stabilize by splint fractures located above the elbow or knee.

Care must be taken when moving an injured animal, avoiding jerking movements or displacement of bones. The back and neck should not be manipulated. Ideally, a piece of wood is used to carry the animal. When necessary, a stretcher can be made from a blanket or coat. The least desirable method of transport is arm carriage.

Commonly encountered emergency problems include profuse diarrhea with dehydration, inability to urinate, labored breathing, enlarged abdomen, seizures lasting more than 5 minutes, loss of consciousness, excessive bleeding, history of poisoning, prolapsed organs, potential snake bite, shock, collapse, pale gums, open wounds exposing extensive soft tissue or bone, dystocia, absence of breathing, protracted vomiting, and inability to walk. These problems, or abnormal parameters found on the at-home physical examination, should alert the owner to seek emergency care for the animal.

If poisoning is suspected, immediate veterinary attention is required. If possible, bring in the container or a sample of the product. Do not initiate vomiting without contacting the veterinarian first.

One of the most acute emergencies is gastric dilatation-volvulus syndrome (bloat). It occurs primarily in large breeds of dogs.

Published protocols for the initial management of dogs with GDV recommend immediate gastric decompression and lavage with sequent fluid and glucocorticosteroid therapy. Since 1982, a protocol has been employed in the Veterinary Hospital of the University of Pennsylvania emergency service for the initial stabilization which differs from the published recommendations. The protocol promotes fluid volume replacement, glucocorticosteroid administration, and correction of significant ECG alterations prior to gastric decompression. A review of our case records from 1984 until present finds a mortality rate of only 20%, with 17 deaths of 89 dogs with GDV. This is a substantial reduction from reported mortality rates. We feel strongly that this increase in survival is largely due to therapeutic support of blood volume and blood pressure prior to gastric decompression.

Emergency care for animals has come a long way and is now considered a special discipline. Equipment and treatment are as sophisticated as in human hospitals and the survival rates have increased greatly.